



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/091,959	03/06/2002	Yun-Fei Li	HT01-032	8399
28112	7590	03/18/2005	EXAMINER	
GEORGE O. SAILE & ASSOCIATES			DAVIS, DAVID DONALD	
28 DAVIS AVENUE			ART UNIT	
POUGHKEEPSIE, NY 12603			PAPER NUMBER	

2652

DATE MAILED: 03/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/091,959	<b>Applicant(s)</b> LI ET AL.	
	<b>Examiner</b> David D. Davis	<b>Art Unit</b> 2652	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-39 is/are pending in the application.  
     4a) Of the above claim(s) 1-22 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 23-39 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
     a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>05/17/02</u> . | 6) <input type="checkbox"/> Other: ____.  |

Art Unit: 2652

## **DETAILED ACTION**

### ***Election/Restrictions***

1. During a telephone conversation with Steve Ackerman on January 28, 2005 a provisional election was made with traverse to prosecute the invention of Group II, claims 23-29.

Affirmation of this election must be made by applicant in replying to this Office action. Claims 1-22 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

### ***Information Disclosure Statement***

2. Receipt is acknowledged of the Information Disclosure Statement (IDS) received May 17, 2002.

### ***Specification***

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2652

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 23-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al (2003/0156361) in view of Gill et al (US (6,654,211)). As per claims 23 and 33, Li et al shows in figure 8 a magnetic read head structure including a bottom spin valve structure having a topmost layer that is a free layer 27 having an upper surface. On the free layer 27, an exchange coupling layer 28 and on the exchange coupling layer 28 is two opposing plugs of a laminate of a conducting lead layer 20 on an antiferromagnetic layer 29 on a ferromagnetic layer 25.

Figure 8 of Li et al also shows the plugs separated by a gap that defines a read width for the structure. Additionally, Li et al shows in figure 3 that the ferromagnetic layer 25 is permanently biased in a longitudinal direction by exchange coupling with the antiferromagnetic layer 29, and the free layer 27 outside of the gap is permanently biased in a longitudinal direction by exchange coupling with the antiferromagnetic layer 29 through the exchange coupling layer 28.

As per claim 24, Li et al discloses in section 55 and shows in figure 8 that the exchange coupling layer 28 is selected from the group consisting of Cu, Ru, Rh, and Ag, including being a laminate of more than one member of the group. As per claim 25, Li et al also discloses in

Art Unit: 2652

section 55 and shows in figure 8 that the exchange coupling layer 28 has a thickness between about 3 and 20 Angstroms.

As per claims 26 and 36, Li et al discloses in section 55 that the ferromagnetic layer 25 is selected from the group consisting of NiFe, CoFe, and a combination of CoFe and NiFe. As per claim 27, Li et al discloses in section 34 the ferromagnetic layer 25 has a thickness between about 5 and 50 Angstroms.

As per claim 28, Li et al discloses in section 55 that the antiferromagnetic layer 29 is selected from the group consisting of NiMn, PtMn, IrMn, and RhRuMn. As per claim 29, Li et al discloses in section 55 that the antiferromagnetic layer 29 has a thickness between about 20 and 500 Angstroms. As per claims 32 and 39, Li et al discloses in section 35 that the trackwidth or the gap is between about 0.02 and 0.5 microns wide.

Regarding claims 23 and 33, Li et al is silent, however, as to in the gap, a layer of oxides of the antiferromagnetic, ferromagnetic, and exchange coupling layers 28 with the oxide layer being a protective layer for the free layer 27.

Regarding claim 30, Li et al is also silent as to the conducting lead layer being any combination of elements selected from the group consisting of Au, Rh, Ni, Ag, Cu, Ti, and Ta. Regarding claim 34, Li et al is additionally silent as to the exchange coupling layer 28 contains between about 30 and 70 atomic percent of Ru.

Regarding claims 31, 35, 37 and 38, Li et al is further silent as to the conducting lead layer having a thickness between about 50 and 500 Angstroms, the exchange coupling layer 28 having a thickness of about 10 Angstroms, the ferromagnetic layer 25 being about 45 Angstroms

Art Unit: 2652

thick and the free layer having a thickness about 10 Angstroms of CoFe on about 20 Angstroms of NiFe.

Gill et al shows in figure 12 an oxide layer being a protective layer for the free layer 204.

Official notice is taken of the fact that conducting lead layers being any combination of elements selected from the group consisting of Au, Rh, Ni, Ag, Cu, Ti, and Ta and exchange coupling layer containing between about 30 and 70 atomic percent of Ru is notoriously old and well known in the magnetic head art.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to provide the magnetic read head structure of Li et al with an oxide layer being a protective layer for the free layer as taught by Gill et al. The rationale is as follows: one of ordinary skill in the art at the time the invention was made would have been motivated to provide a magnetic read head structure with an oxide layer being a protective layer for the free layer to "protect the free layer structure 204 from subsequent processing steps, however, in the present invention it increases the magnetoresistive coefficient  $dr/R$  of the spin valve sensor". See column 5, lines 51-67 of Gill et al.

It also would have been obvious to a person having ordinary skill in the art at the time the invention was made to specify that the conducting lead layer of Li et al has any combination of elements selected from the group consisting of Au, Rh, Ni, Ag, Cu, Ti, and Ta as taught in the art. The rationale is as follows: one of ordinary skill in the art at the time the invention was made would have been motivated to provide a conducting lead layer with any combination of elements selected from the group consisting of Au, Rh, Ni, Ag, Cu, Ti, and Ta, which is well within the purview of a skilled artisan and absent an unobvious result, so as to provide an

Art Unit: 2652

effective and optimized lead layer due to the inherent conductive properties of the listed materials.

It additionally would have been obvious to a person having ordinary skill in the art at the time the invention was made to specify that the exchange coupling layer of Li et al contains between about 30 and 70 atomic percent of Ru as taught in the art.

The rationale is as follows: one of ordinary skill in the art at the time the invention was made would have been motivated to specify that an exchange coupling layer contains between about 30 and 70 atomic percent of Ru, which is well within the purview of a skilled artisan and absent an unobvious result, so as to provide effective and optimized coupling between the layers adjacent the coupling layer.

It further would have been obvious to a person having ordinary skill in the art at the time the invention was made to specify the thickness of the conducting lead layer, the exchange coupling layer, the ferromagnetic layer and the free layer of Li et al as taught in the art. The rationale is as follows: one of ordinary skill in the art at the time the invention was made would have been motivated to specify the thickness of the conducting lead layer, the exchange coupling layer, the ferromagnetic layer and the free layer, which is well within the purview of a skilled artisan and absent an unobvious result, so as to effectively optimize the magnetoresistive head to obtain the best read signal from the magnetic medium.


### ***Conclusion***

Art Unit: 2652

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David D. Davis whose telephone number is (703) 308-1503. The examiner can normally be reached on Monday thru Friday between 9:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa T. Nguyen can be reached on (703) 305-9687. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
David D. Davis  
Primary Examiner  
Art Unit 2652

ddd